TFT LCD Approval Specification

MODEL NO.: N154C6 - L02

Customer : Dell

Approved by : _____

Note :

記錄	工作	審核	角色	投票
2008-03-20 07:52:33 CST	PMMD Director	cs_lee(李志聖 /56510/44926)	Director	Accept

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REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver 3.0	Feb. 22, '08	All		Approval Specification for Customer (Dell)

1. GENERAL DESCRIPTION

1.1 OVERVIEW

N154C6 - L01 is a 15.4" TFT Liquid Crystal Display module with LED Backlight unit and 40 pins LVDS interface. This module supports 1440 x 900 Wide-XGA+ mode and can display 262,144 colors. The optimum viewing angle is at 6 o'clock direction. The converter module for Backlight is not built in.

1.2 FEATURES

- Thin and High Brightness
- WXGA + (1440 x 900 pixels) resolution
- 3.3V LVDS (Low Voltage Differential Signaling) interface with 2 pixel/clock
- RoHS compliance

1.3 APPLICATION

- TFT LCD Notebook

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Active Area	331.560(H) x 207.225(V) (15.4" diagonal)	mm	(1)
Bezel Opening Area	**334.6 (H) x 211.1 (V)**	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1440 (H) x 3 (R.G.B.) x 900 (V)	pixel	-
Pixel Pitch	**0.23025** (H) x **0.23025** (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	262,144	color	-
Transmissive Mode	Normally white	-	-
Surface Treatment	3H, Glare Type	-	-

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	343.5	344.0	344.5	mm	(1)
	Vertical (V)	221.5	222.0	222.5	mm	
	Depth (D)	---	---	6.1	mm	
Weight		---	430	450	g	-

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

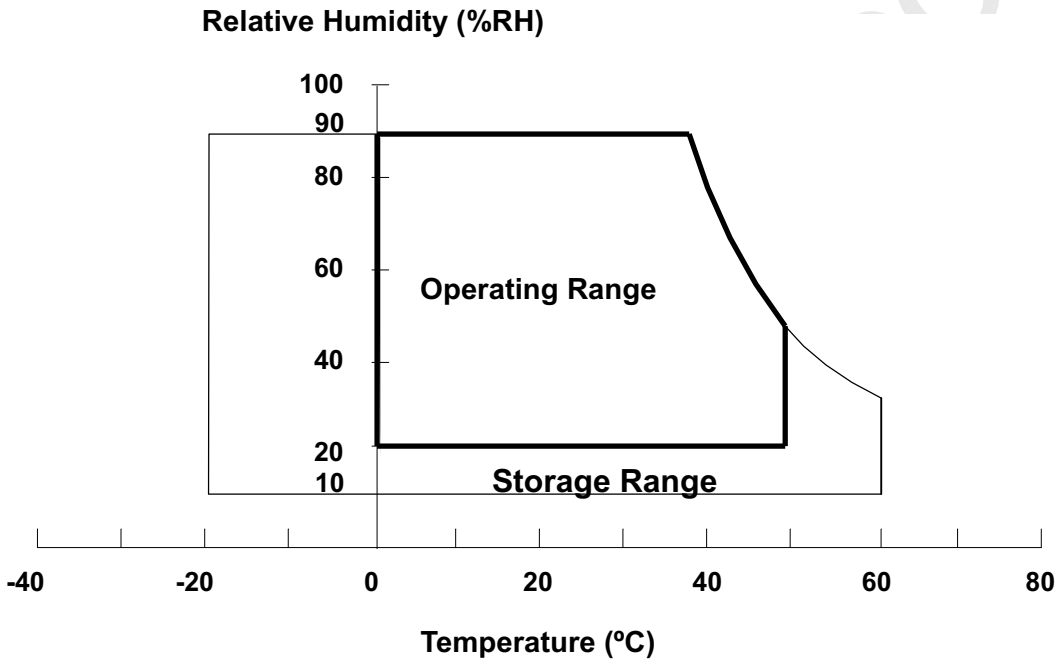
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)
Shock (Non-Operating)	S_{NOP}	-	200/2	G/ms	(3), (5)
Vibration (Non-Operating)	V_{NOP}	-	1.5	G	(4), (5)

Note (1) (a) 90 %RH Max. (Ta ≦ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(c) No condensation.

Note (2) The temperature of panel display surface area should be 0 ºC Min. and 50 ºC Max.

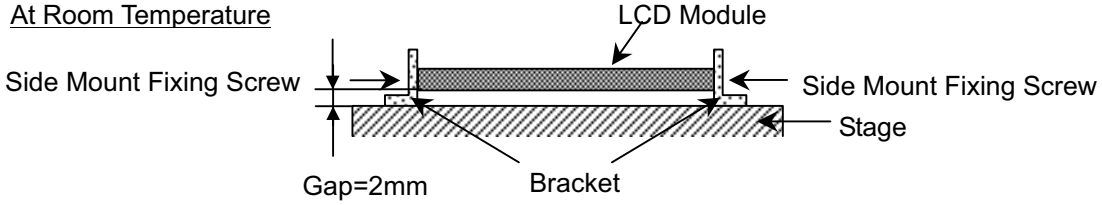


Note (3) 1 time for ± X, ± Y, ± Z. for Condition (200G / 2ms) is half Sine Wave,.

Note (4) 10 ~ 500 Hz, 30 min/cycle,1cycles for each X, Y, Z axis.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

The fixing condition is shown as below:



2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	V_{CC}	-0.3	+4.0	V	(1)
Logic Input Voltage	V_{IN}	-0.3	V_{CC}+0.3	V	

2.2.2 BACKLIGHT UNIT

Item	Value		Unit	Note
	Min	Max.		
LED Light Bar Power Supply Voltage	30	34	V	(1),(2)
LED Light Bar Power Supply Current	114	150	mA_{DC}	
LED Peak Pulse Current	-	80	mA_{DC}	

Note (1) Permanent damage to the device may occur if maximum or minimum values are exceeded.

Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for LED (Refer to Section 3.2 for further information).

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta = 25 ± 2 ºC

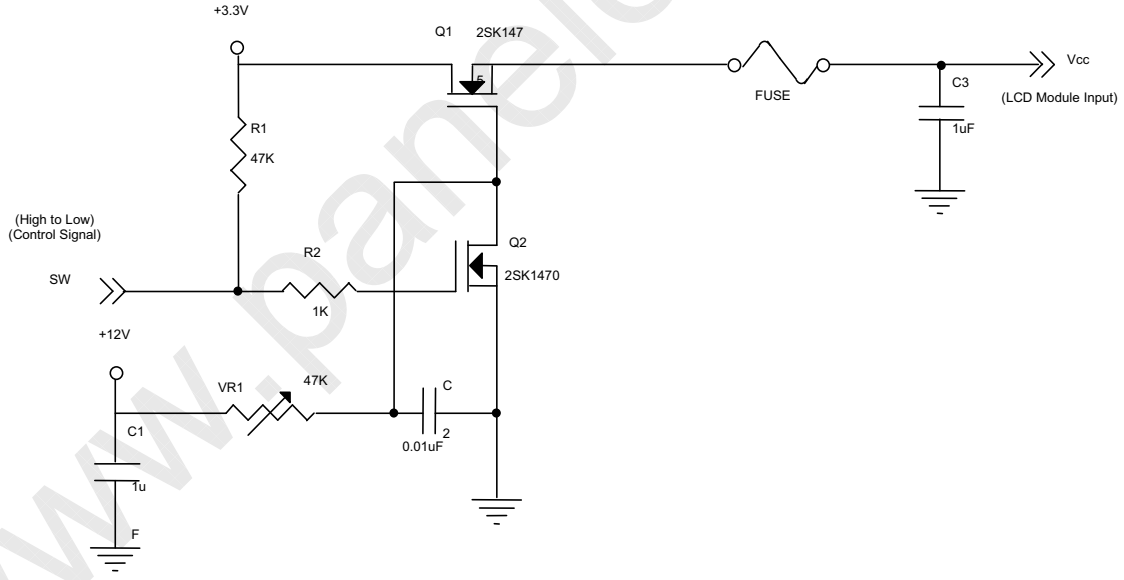
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	3.0	3.3	3.6	V	-
Ripple Voltage		V_{RP}	-	50	-	mV	-
Rush Current		I_{RUSH}	-	-	1.5	A	(2)
Initial Stage Current		I_{IS}			1.0	A	(2)
Power Supply Current	White	Lcc	-	240	290	mA	(3)a
	Black		-	350	400	mA	(3)b
LVDS Differential Input High Threshold		$V_{TH(LVDS)}$	-	-	+100	mV	(4), V_{CM}=1.2V
LVDS Differential Input Low Threshold		$V_{TL(LVDS)}$	-100	-	-	mV	(4), V_{CM}=1.2V
LVDS Common Mode Voltage		V_{CM}	1.125	-	1.375	V	(4)
LVDS Differential Input Voltage		$\|V_{ID}\|$	100	-	600	mV	(4)
Terminating Resistor		R_T	-	100	-	Ohm	
Power per EBL WG		P_{EBL}		1.90		W	(4)

Note (1) The module should be always operated within above ranges.

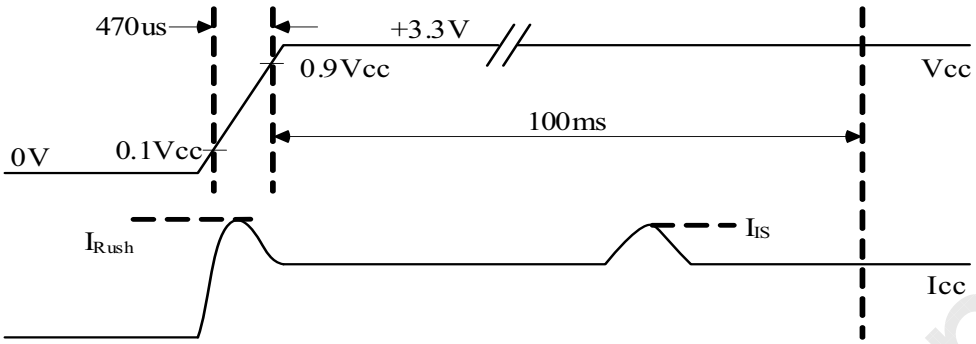
Note (2) I_{RUSH}: the maximum current when VCC is rising

I_{IS}: the maximum current of the first 100ms after power-on

Measurement Conditions: Shown as the following figure. Test pattern: black.



Vcc rising time is 470us



Note (3) The specified power supply current is under the conditions at Vcc = 3.3 V, Ta = 25 ± 2 ºC, f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

Active Area

b. Black Pattern

Active Area

Note (4) The specified power are the sum of LCD panel electronics input power and the inverter input power. Test conditions are as follows.

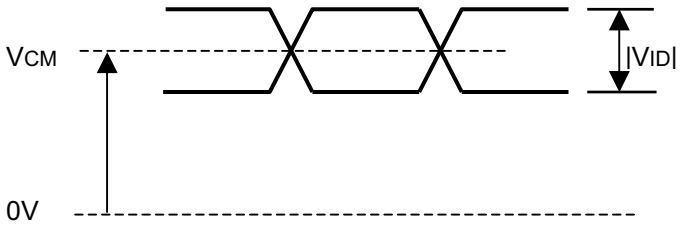
(a) Vcc = 3.3 V, Ta = 25 ± 2 ºC, f_v = 60 Hz,

(b) The pattern used is a black and white 32 x 36 checkerboard, slide #100 from the VESA file "Flat Panel Display Monitor Setup Patterns", FPDMSU.ppt.

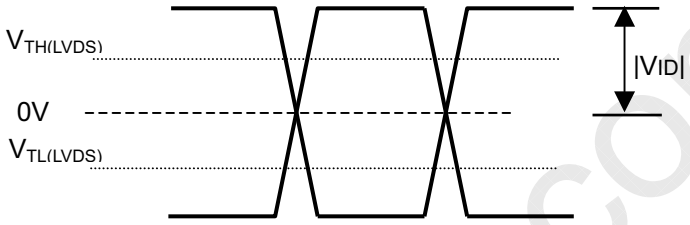
(c) Luminance: 60 nits.

Note (5) The parameters of LVDS signals are defined as the following figures.

Single Ended



Differential

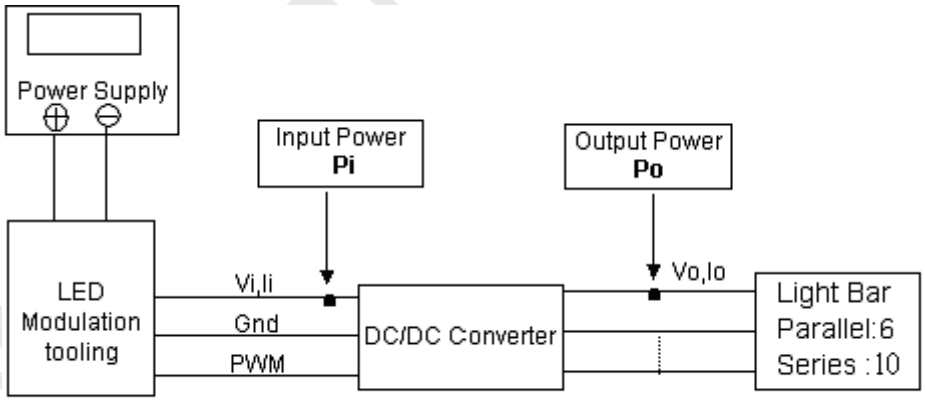


3.2 BACKLIGHT UNIT

Ta = 25 ± 2 ºC

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Quantity			60		PCs	(1)
LED Light Bar Power Supply Voltage	V_L	30	32	34	V	(1),(2) (Duty 100%)
LED Light Bar Power Supply Current	I_L	114	120	150	mA	
Power Consumption	P_L	3.6	3.84	4.08	W	(3), (Duty 100%)
LED Life Time	L_{BL}	10000	--	--	Hrs	(4)

Note (1) LED light bar configuration is shown as below.



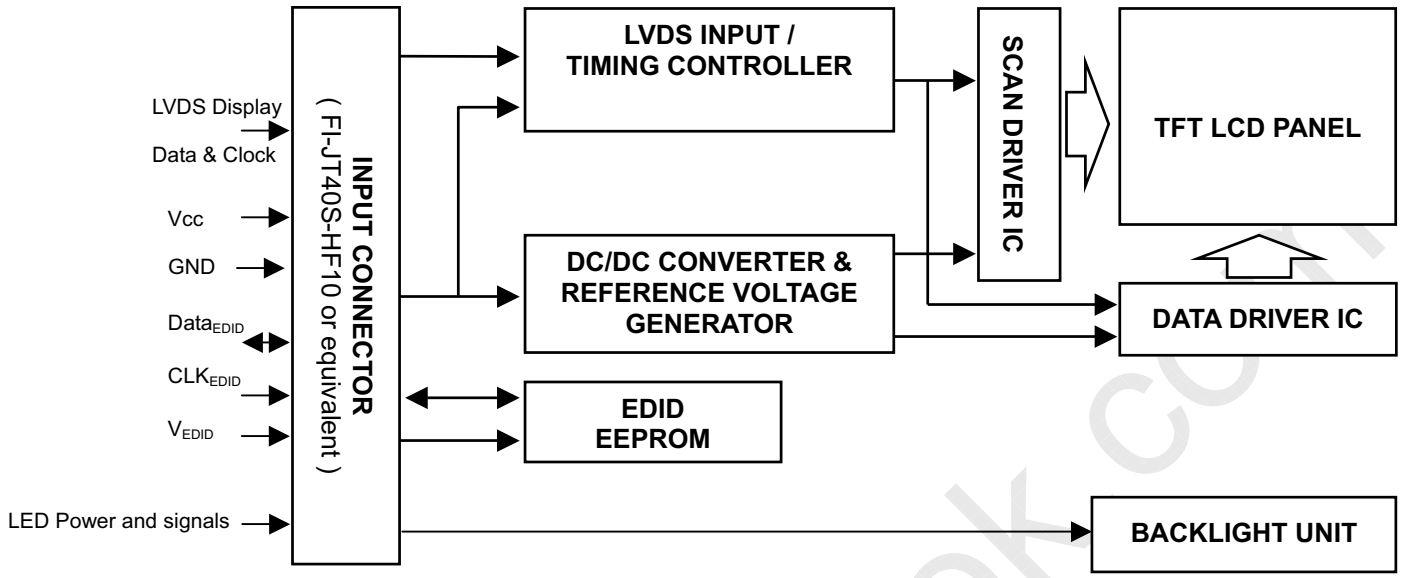
Note (2) For better LED light bar driving quality, it is recommended to utilize the adaptive boost converter with current balancing function to drive LED light-bar.

Note (3) $P_L = I_L \times V_L$

Note (4) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 °C and I_L = 20 mA(Per EA) until the brightness becomes ≦ 50% of its original value.

4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



5. INPUT TERMINAL PIN ASSIGNMENT

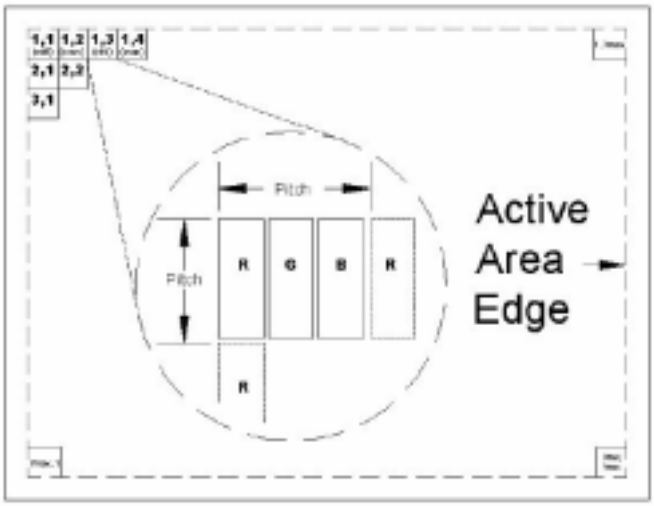
5.1 TFT LCD MODULE

Pin	Symbol	Description	Polarity	Remark
1	Vss	Ground		
2	Vcc	Power Supply +3.3 V (typical)		
3	Vcc	Power Supply +3.3 V (typical)		
4	V_{EDID}	DDC 3.3V Power		
5	Vcc	Power Supply +3.3 V (typical)		
6	CLK_{EDID}	DDC Clock		
7	$DATA_{EDID}$	DDC Data		
8	RXO0-	LVDS Differential Data Input (Odd)	Negative	
9	RXO0+	LVDS Differential Data Input (Odd)	Positive	
10	Vss	Ground		
11	RXO1-	LVDS Differential Data Input (Odd)	Negative	
12	RXO1+	LVDS Differential Data Input (Odd)	Positive	
13	Vss	Ground		
14	RXO2-	LVDS Differential Data Input (Odd)	Negative	
15	RXO2+	LVDS Differential Data Input (Odd)	Positive	
16	Vss	Ground		
17	RXOC-	LVDS Clock Data Input (Odd)	Negative	
18	RXOC+	LVDS Clock Data Input (Odd)	Positive	
19	Vss	Ground		
20	RxE0-	LVDS Differential Data Input (Even)	Negative	
21	RxE0+	LVDS Differential Data Input (Even)	Positive	
22	Vss	Ground		
23	RxE1-	LVDS Differential Data Input (Even)	Negative	
24	RxE1+	LVDS Differential Data Input (Even)	Positive	
25	Vss	Ground		
26	RxE2-	LVDS Differential Data Input (Even)	Negative	
27	RxE2+	LVDS Differential Data Input (Even)	Positive	
28	Vss	Ground		
29	RXEC-	LVDS Clock Data Input (Even)	Negative	
30	RXEC+	LVDS Clock Data Input (Even)	Positive	
31	VFB1	LED Cathode (Negative)		
32	VFB2	LED Cathode (Negative)		
33	VFB3	LED Cathode (Negative)		
34	VFB4	LED Cathode (Negative)		
35	VFB5	LED Cathode (Negative)		
36	VFB6	LED Cathode (Negative)		
37	NC	Non-Connection		
38	Vdc	LED Annold (Positive)		
39	Vdc	LED Annold (Positive)		
40	Vdc	LED Annold (Positive)		

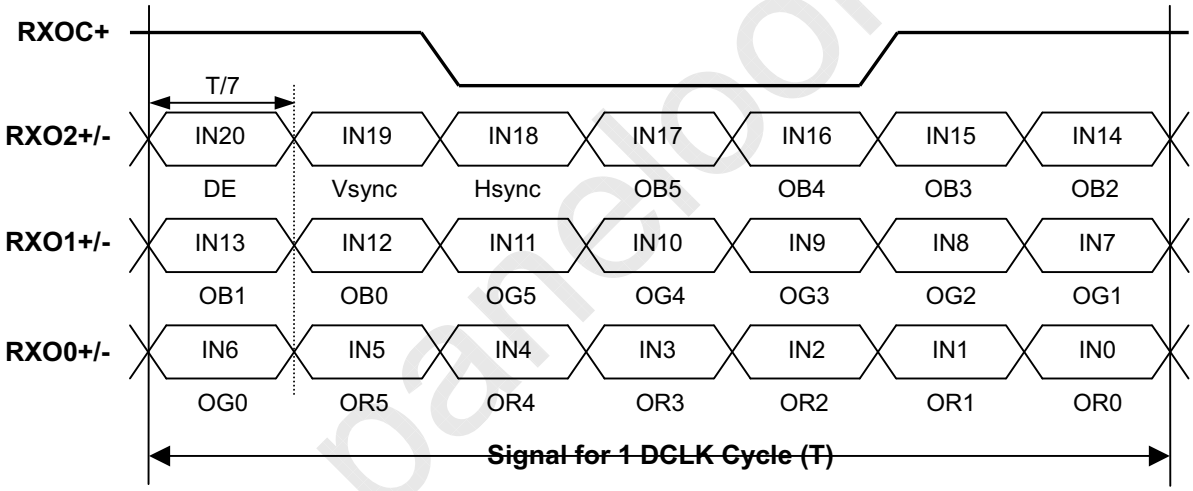
Note (1) Connector Part No.: FI-JT40S-HF10 or equivalent

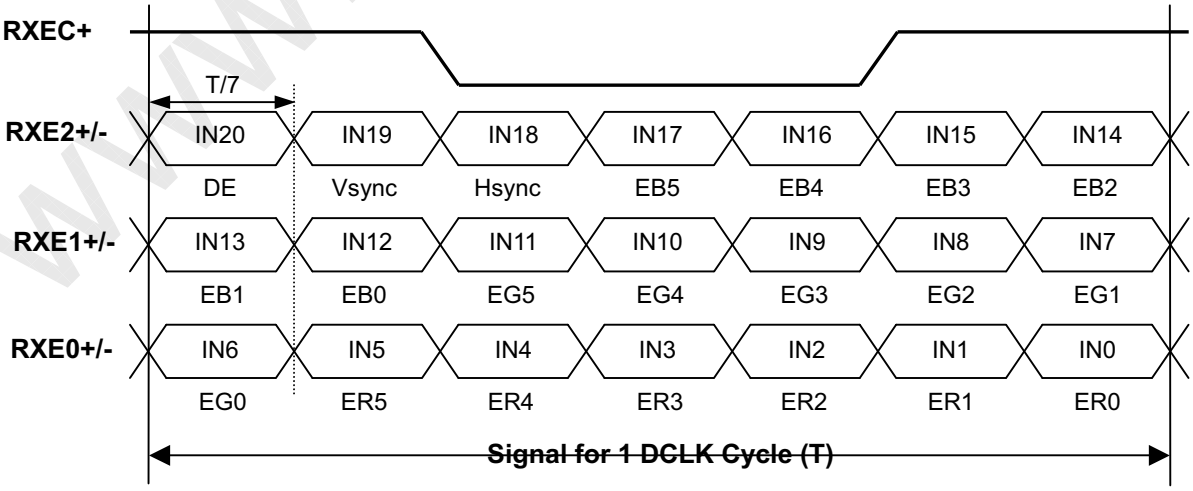
Note (2) User's connector Part No: FI-JT40C or equivalent

Note (3) The first pixel is odd as shown in the following figure.



5.2 TIMING DIAGRAM OF LVDS INPUT SIGNAL





5.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																	
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
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	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
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	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
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	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

5.4 EDID DATA STRUCTURE

The EDID (Extended Display Identification Data) data formats are to support displays as defined in the VESA Plug & Display and FPDI standards.

Byte # (decimal)	Byte # (hex)	Field Name and Comments	Value (hex)	Value (binary)
0	0	Header	00	00000000
1	1	Header	FF	11111111
2	2	Header	FF	11111111
3	3	Header	FF	11111111
4	4	Header	FF	11111111
5	5	Header	FF	11111111
6	6	Header	FF	11111111
7	7	Header	00	00000000
8	8	EISA ID manufacturer name (“CMO”)	0D	00001101
9	9	EISA ID manufacturer name (Compressed ASCII)	AF	10101111
10	0A	ID product code (N154C6-L02)	55	01010101
11	0B	ID product code (hex LSB first; N154C6-L02)	15	00010101
12	0C	ID S/N (fixed “0”)	00	00000000
13	0D	ID S/N (fixed “0”)	00	00000000
14	0E	ID S/N (fixed “0”)	00	00000000
15	0F	ID S/N (fixed “0”)	00	00000000
16	10	Week of manufacture	1B	00011011
17	11	Year of manufacture	11	00010001
18	12	EDID structure version # (“1”)	01	00000001
19	13	EDID revision # (“3”)	03	00000011
20	14	Video I/P definition (“digital”)	90	10010000
21	15	Active area horizontal 34.4cm	22	00100010
22	16	Active area vertical 22.2cm	16	00010110
23	17	Display Gamma (Gamma = ”2.2”)	78	01111000
24	18	Feature support (“Active off, RGB Color”)	0A	00001010
25	19	Red/Green (Rx1, Rx0, Ry1, Ry0, Gx1, Gx0, Gy1, Gy0)	50	01010000
26	1A	Blue/White (Bx1, Bx0, By1, By0, Wx1, Wx0, Wy1, Wy0)	C5	11000101
27	1B	Red-x (Rx = “0.595”)	98	10011000
28	1C	Red-y (Ry = “0.345”)	58	01011000
29	1D	Green-x (Gx = ”0.320”)	52	01010010
30	1E	Green-y (Gy = ”0.555”)	8E	10001110
31	1F	Blue-x (Bx = ”0.155”)	27	00100111
32	20	Blue-y (By = ”0.145”)	25	00100101
33	21	White-x (Wx = ”0.313”)	50	01010000
34	22	White-y (Wy = ”0.329”)	54	01010100
35	23	Established timings 1	00	00000000
36	24	Established timings 2 (1440*900@60Hz)	00	00000000
37	25	Manufacturer’s reserved timings	00	00000000
38	26	Standard timing ID # 1	01	00000001
39	27	Standard timing ID # 1	01	00000001
40	28	Standard timing ID # 2	01	00000001
41	29	Standard timing ID # 2	01	00000001

42	2A	Standard timing ID # 3	01	00000001
43	2B	Standard timing ID # 3	01	00000001
44	2C	Standard timing ID # 4	01	00000001
45	2D	Standard timing ID # 4	01	00000001
46	2E	Standard timing ID # 5	01	00000001
47	2F	Standard timing ID # 5	01	00000001
48	30	Standard timing ID # 6	01	00000001
49	31	Standard timing ID # 6	01	00000001
50	32	Standard timing ID # 7	01	00000001
51	33	Standard timing ID # 7	01	00000001
52	34	Standard timing ID # 8	01	00000001
53	35	Standard timing ID # 8	01	00000001
54	36	Detailed timing description # 1 Pixel clock (“88.75MHz”, According to VESA CVT Rev1.1)	AB	10101011
55	37	# 1 Pixel clock (hex LSB first)	22	00100010
56	38	# 1 H active (“1440”)	A0	10100000
57	39	# 1 H blank (“160”)	A0	10100000
58	3A	# 1 H active : H blank (“1440 : 160”)	50	01010000
59	3B	# 1 V active (”900”)	84	10000100
60	3C	# 1 V blank (”26”)	1A	00011010
61	3D	# 1 V active : V blank (”900 :26”)	30	00110000
62	3E	# 1 H sync offset (”48”)	30	00110000
63	3F	# 1 H sync pulse width ("32”)	20	00100000
64	40	# 1 V sync offset : V sync pulse width (”3 : 6”)	36	00110110
65	41	# 1 H sync offset : H sync pulse width : V sync offset : V sync width (”48: 32 : 3 : 6”)	00	00000000
66	42	# 1 H image size (”303 mm”)	2F	00101111
67	43	# 1 V image size (”190 mm”)	BE	10111110
68	44	# 1 H image size : V image size (”303 : 190”)	10	00010000
69	45	# 1 H boarder (”0”)	00	00000000
70	46	# 1 V boarder (”0”)	00	00000000
71	47	# 1 Non-interlaced ; Normal display, no stereo ; Digital Separate ; V sync POL is negative; H sync POL is positive	1A	00011010
72	48	Detailed timing description # 1 Pixel clock (“88.75MHz”, According to VESA CVT Rev1.1)	AB	10101011
73	49	# 1 Pixel clock (hex LSB first)	22	00100010
74	4A	# 1 H active (“1440”)	A0	10100000
75	4B	# 1 H blank (“160”)	A0	10100000
76	4C	# 1 H active : H blank (“1440 : 160”)	50	01010000
77	4D	# 1 V active (”900”)	84	10000100
78	4E	# 1 V blank (”26”)	1A	00011010
79	4F	# 1 V active : V blank (”900 :26”)	30	00110000
80	50	# 1 H sync offset (”48”)	30	00110000
81	51	# 1 H sync pulse width ("32”)	20	00100000
82	52	# 1 V sync offset : V sync pulse width (”3 : 6”)	36	00110110
83	53	# 1 H sync offset : H sync pulse width : V sync offset : V sync width (”48: 32 : 3 : 6”)	00	00000000
84	54	# 1 H image size (”303 mm”)	2F	00101111

85	55	# 1 V image size (”190 mm”)	BE	10111110
86	56	# 1 H image size : V image size (”303 : 190”)	10	00010000
87	57	# 1 H boarder (”0”)	00	00000000
88	58	# 1 V boarder (”0”)	00	00000000
89	59	# 1 Non-interlaced ; Normal display, no stereo ; Digital Separate ; V sync POL is negative; H sync POL is positive	1A	00011010
90	5A	Detailed timing description # 3	00	00000000
91	5B	# 3 Flag	00	00000000
92	5C	# 3 Reserved	00	00000000
93	5D	# 3 FE (hex) defines ASCII string (Model Name “N154C6”, ASCII)	FE	11111110
94	5E	# 3 Flag	00	00000000
95	5F	# Dell P/N "FX313" 1st character (“F”)	46	01000110
96	60	# Dell P/N " FX313" 1st character (“X”)	58	01011000
97	61	# Dell P/N " FX313" 1st character (“3”)	33	00110011
98	62	# Dell P/N " FX313" 1st character (“1”)	31	00110001
99	63	# Dell P/N " FX313" 1st character (“3”)	33	00110011
100	64	LCD Supplier EEDID Revision #: "1"	81	10000001
101	65	Manufacturer P/N ("N")	4E	01001110
102	66	Manufacturer P/N ("1")	31	00110001
103	67	Manufacturer P/N ("5")	35	00110101
104	68	Manufacturer P/N ("4")	34	00110100
105	69	Manufacturer P/N ("C")	43	01000011
106	6A	Manufacturer P/N ("6")	36	00110110
107	6B	Manufacturer P/N (If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	0A	00001010
108	6C	Flag	00	00000000
109	6D	Flag	00	00000000
110	6E	Flag	00	00000000
111	6F	Data Type Tag:	00	00000000
112	70	Flag	00	00000000
113	71	SMBUS value @ 10nits = 06d	06	00000110
114	72	SMBUS value @ 17nits = 10d	0A	00001010
115	73	SMBUS value @ 24nits = 13d	0D	00001101
116	74	SMBUS value @ 30nits = 17d	11	00010001
117	75	SMBUS value @ 60nits = 33d	21	00100001
118	76	SMBUS value @ 110nits = 61d	3D	00111101
119	77	SMBUS value @ 150nits = 83d	53	01010011
120	78	SMBUS value @ max nits = 255d	FF	11111111
121	79	Bit[1:0] 00:reserved, 01:single LVDS, 10:dual LVDS, 11: reserved Bit[2] 0: No RTC support , 1: RTC support Bit[7:3] Reserved	02	00000010
122	7A	BIST Enable: Yes = '01' No = '00' ("No")	00	00000000
123	7B	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	0A	00001010
124	7C	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
125	7D	(If <13 char, then terminate with ASCII code 0Ah, set remaining	20	00100000

		char = 20h)		
126	7E	Extension flag	00	00000000
127	7F	Checksum	A8	10101000

6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS

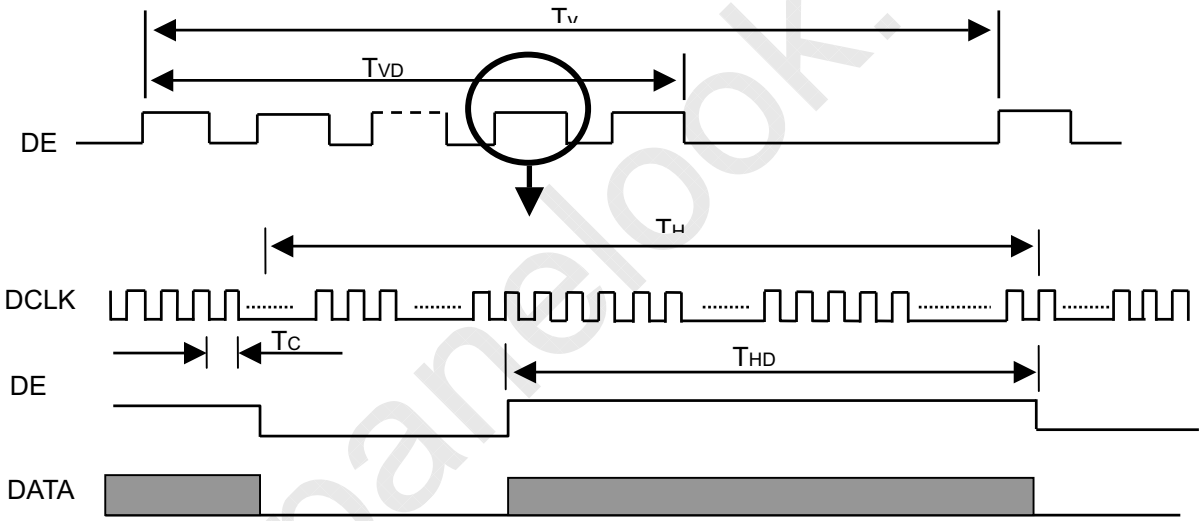
The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc	25	44.5	60	MHz	(2)
DE	Vertical Total Time	TV	910	926	1500	TH	-
	Vertical Active Display Period	TVD	900	900	900	TH	-
	Vertical Active Blanking Period	TVB	TV-TVD	26	TV-TVD	TH	
	Horizontal Total Time	TH	760	800	880	Tc	(2)
	Horizontal Active Display Period	THD	720	720	720	Tc	(2)
	Horizontal Active Blanking Period	THB	TH-THD	80	TH-THD	Tc	(2)

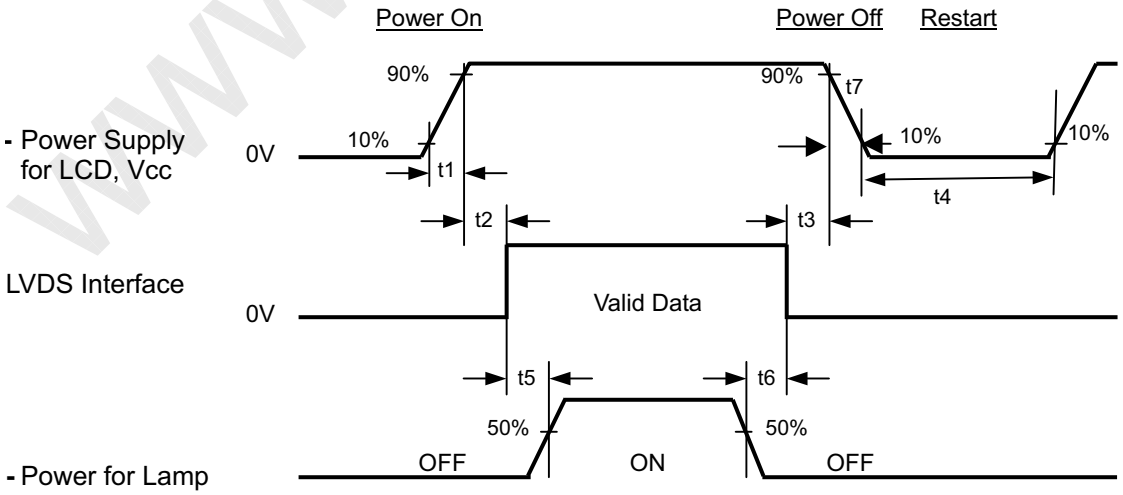
Note (1) Because this module is operated by DE only mode, Hsync and Vsync are ignored.

(2) 2 channels LVDS input.

INPUT SIGNAL TIMING DIAGRAM



6.2 POWER ON/OFF SEQUENCE



Timing Specifications:

470us < t1 ≦ 10 ms

0 < t2 ≦ 50 ms

0 < t3 ≦ 50 ms

t4 ≧ 500 ms

t5 ≧ 200 ms

t6 ≧ 200 ms

Note (1) Please follow the power on/off sequence described above. Otherwise, the LCD module might be damaged.

Note (2) Please avoid floating state of interface signal at invalid period. When the interface signal is invalid, be sure to pull down the power supply of LCD Vcc to 0 V.

Note (3) The Backlight inverter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight inverter power must be turned off before the power supply for the logic and the interface signal is invalid.

Note (4) Sometimes some slight noise shows when LCD is turned off (even backlight is already off). To avoid this phenomenon, we suggest that the Vcc falling time is better to follow 5≦t7≦300 ms.

7. OPTICAL CHARACTERISTICS

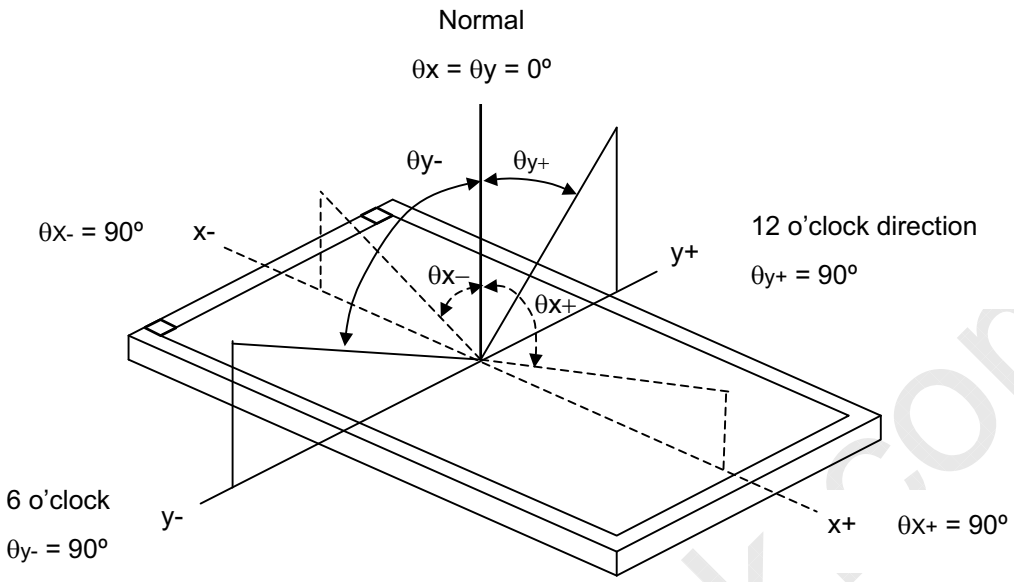
7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current	I_L	120	mA

7.2 OPTICAL SPECIFICATIONS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θ_x=0°, θ_Y =0° Viewing Normal Angle	400	500	-	-	(2), (5)
Response Time		T_R		-	3	8	ms	(3)
		T_F		-	7	12	ms	
Average Luminance of White		L_{5p}		250	300		cd/m^2	(4), (5)
Luminance Non-Uniformity		δW_{5p}		-	-	30	%	(5), (6)
		δW_{13p}		-	-	50	%	
Color Gamut		C.G		42	45	-	%	(5), (7)
Color Chromaticity	Red	Rx		TYP -0.05	0.595	TYP +0.05	-	(1), (5)
		Ry			0.345		-	
	Green	Gx			0.320		-	
		Gy			0.555		-	
	Blue	Bx			0.155		-	
		By			0.145		-	
	White	Wx			0.313		-	
		Wy			0.329		-	
Viewing Angle	Horizontal	θ_x+	CR≥10	65	75	-	Deg.	
		θ_x-		65	75	-		
	Vertical	θ_Y+		55	65	-		
		θ_Y-		60	70	-		

Note (1) Definition of Viewing Angle (θx, θy):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L_{63} / L_0

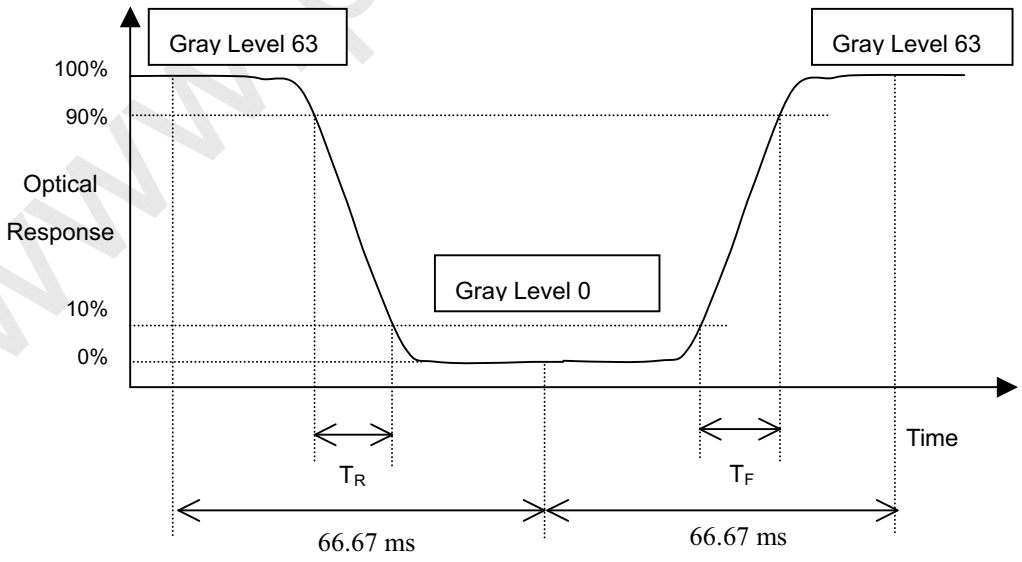
L_{63}: Luminance of gray level 63

L_0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time (T_R, T_F):



Note (4) Definition of Average Luminance of White (L_{5p}):

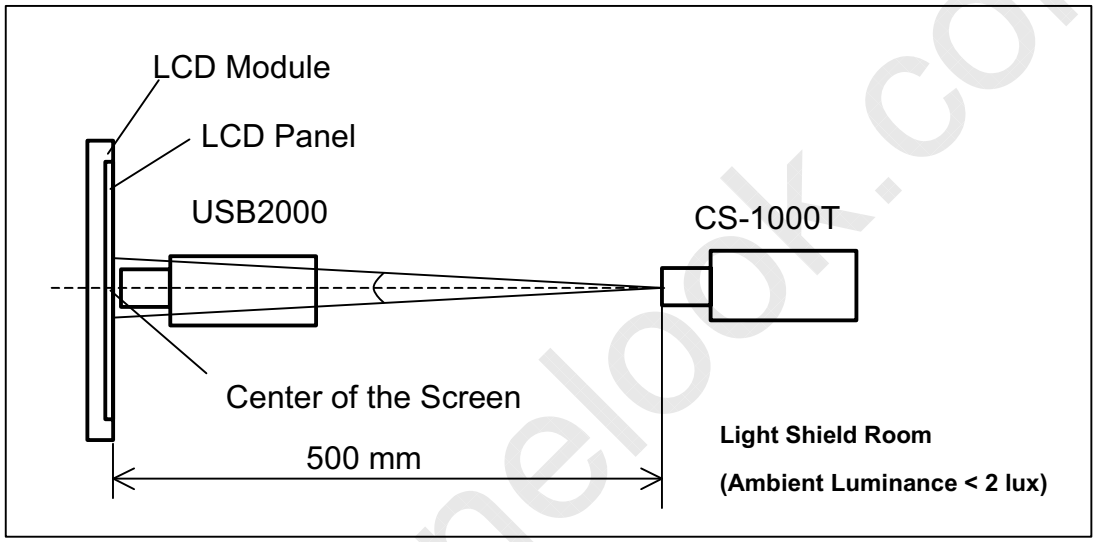
Measure the luminance of gray level 63 at 5 points

L_{5p} = [L (5)+ L (10)+ L (11)+ L (12)+ L (13)] / 5

L (x) is corresponding to the luminance of the point X at Figure in Note (6)

Note (5) Measurement Setup:

The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.

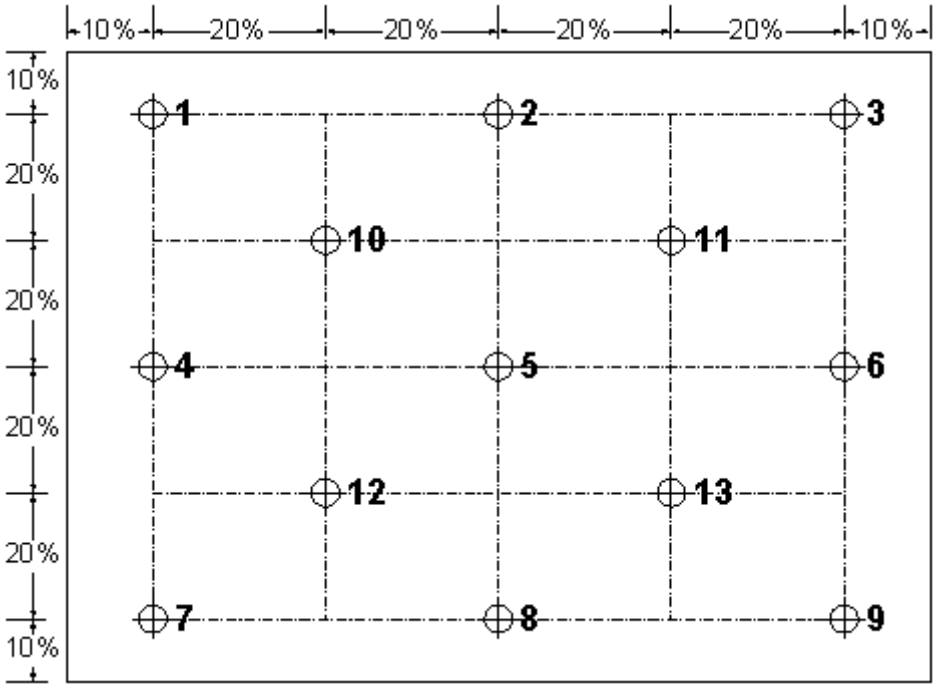


Note (6) Definition of White Variation (δW_{5p}, δW_{13p}):

Measure the luminance of gray level 63 at 5, 13 points

δW_{5p} ={1-{ Minimum [L (5)+ L (10)+ L (11)+ L (12)+ L (13)] / Maximum [L (5)+ L (10)+ L (11)+ L (12)+ L (13)]}} *100%

δW_{13p} ={1-{ Minimum [L (1) ~ L (13)] / Maximum [L (1) ~ L (13)]}} *100%



Note (7) Definition of color gamut (C.G):

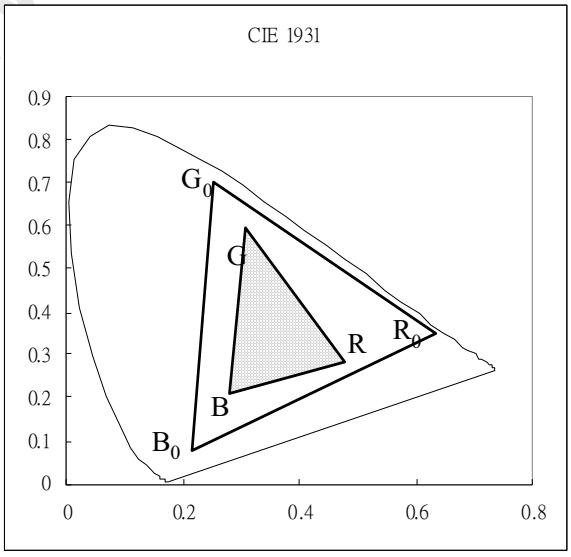
C.G= ΔR G B /ΔR_0 G_0 B_0,*100%

R_0, G_0, B_0 : color coordinates of red, green, and blue defined by NTSC, respectively.

R, G, B : color coordinates of module on 63 gray levels of red, green, and blue, respectively.

ΔR_0 G_0 B_0 : area of triangle defined by R_0, G_0, B_0

ΔR G B: area of triangle defined by R, G, B



8. PRECAUTIONS

8.1 HANDLING PRECAUTIONS

(1) The module should be assembled into the system firmly by using every mounting hole. Be careful not to twist or bend the module.

(2) While assembling or installing modules, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.

(3) Use fingerstalls or soft gloves in order to keep display clean during the incoming inspection and assembly process.

(4) Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily scratched.

(5) If the surface of the polarizer is dirty, please clean it by some absorbent cotton or soft cloth. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanently damage the polarizer due to chemical reaction.

(6) Wipe off water droplets or oil immediately. Staining and discoloration may occur if they left on panel for a long time.

(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contacting with hands, legs or clothes, it must be washed away thoroughly with soap.

(8) Protect the module from static electricity, it may cause damage to the C-MOS Gate Array IC.

(9) Do not disassemble the module.

(10) Do not pull or fold the lamp wire.

(11) Pins of I/F connector should not be touched directly with bare hands.

8.2 STORAGE PRECAUTIONS

(1) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.

(2) It is dangerous that moisture come into or contacted the LCD module, because the moisture may damage LCD module when it is operating.

(3) It may reduce the display quality if the ambient temperature is lower than 10 ºC. For example, the response time will become slowly, and the starting voltage of lamp will be higher than the room temperature.

8.3 OPERATION PRECAUTIONS

(1) Do not pull the I/F connector in or out while the module is operating.

(2) Always follow the correct power on/off sequence when LCD module is connecting and operating. This can prevent the CMOS LSI chips from damage during latch-up.

(3) The startup voltage of Backlight is approximately 1000 Volts. It may cause electrical shock while assembling with inverter. Do not disassemble the module or insert anything into the Backlight unit.

9. PACKING

9.1 CARTON

Box Dimensions : 435(L)*350(W)*325(H)
Weight: Approx. 13.06kg(20 module .per. 1 box)

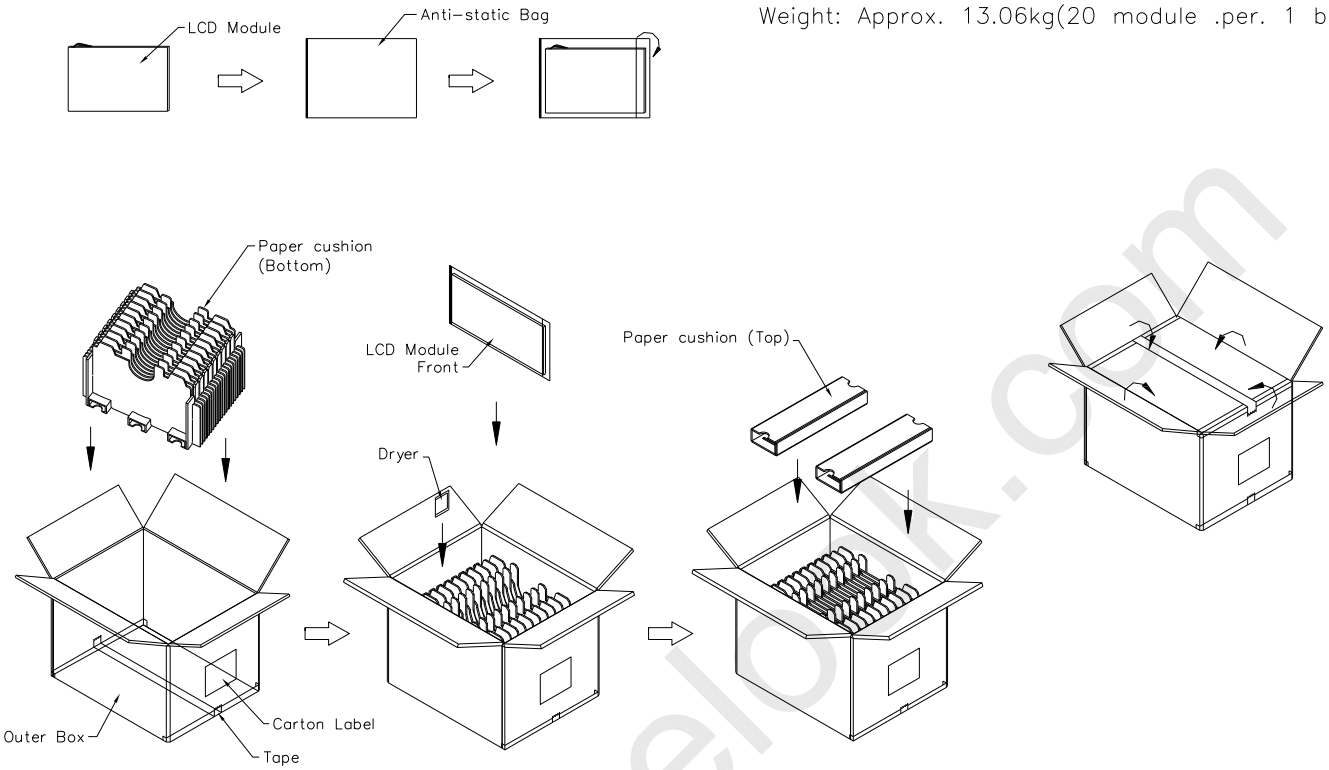


Figure. 9-1 Packing method

9.2 PALLET

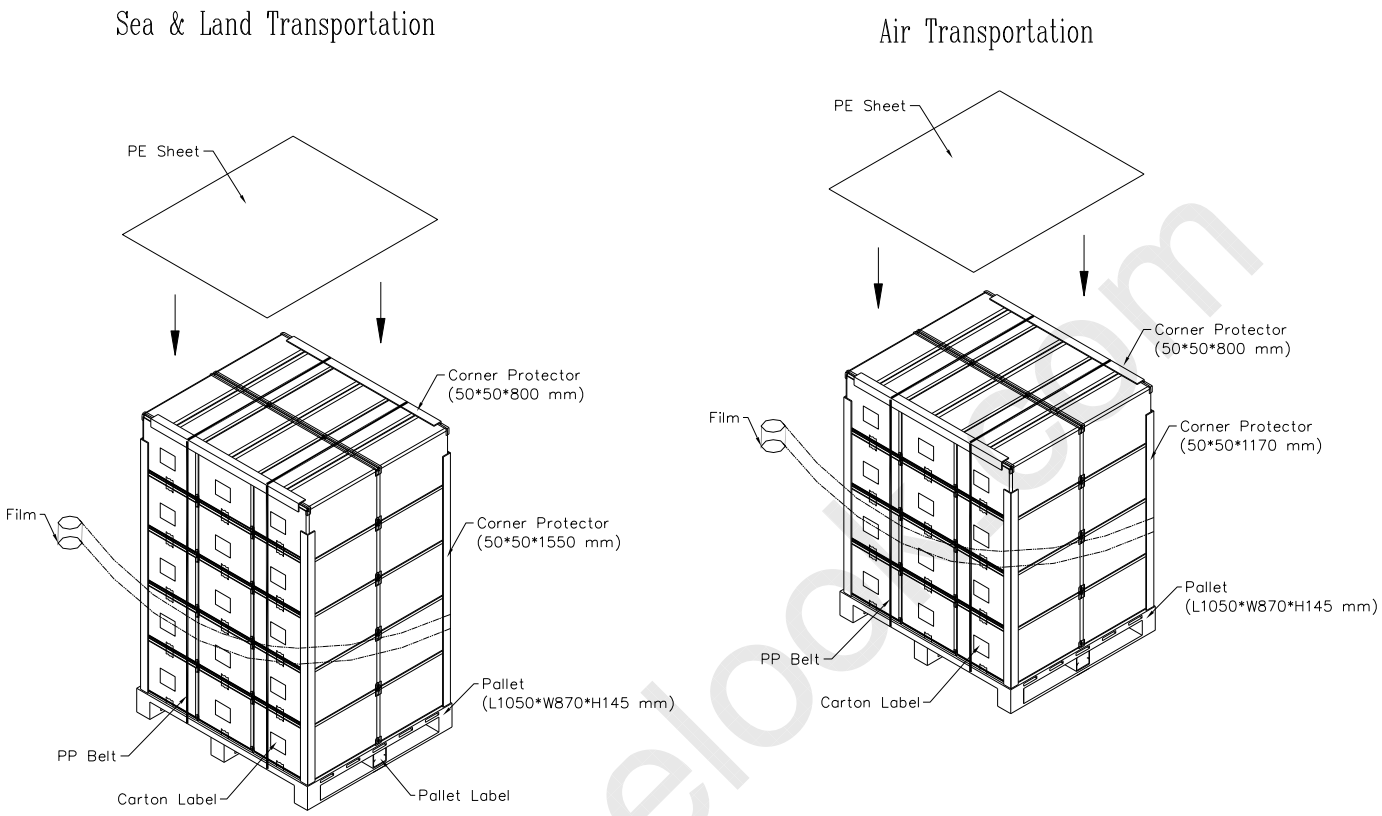
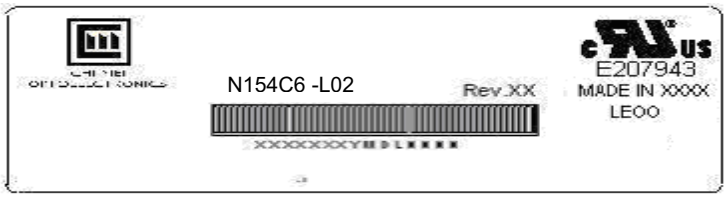


Figure. 9-2 Packing method

10 DEFINITION OF LABELS

11.1 CMO MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(a) Model Name: N154C6 - L02

(b) Revision: Rev. XX, for example: A1, …, C1, C2 …etc.

(c) Serial ID: X X X X X X Y M D X N N N N

- Serial No.
- CMO Internal Use
- Year, Month, Date
- CMO Internal Use
- Revision
- CMO Internal Use

(d) Production Location: MADE IN XXXX. XXXX stands for production location.

(e) UL/CB logo: "LEOO" especially stands for panel manufactured by CMO Ningbo satisfying UL/CB requirement. "LEOO" is the CMO's UL factory code for Ningbo factory.

Serial ID includes the information as below:

(a) Manufactured Date: Year: 1~9, for 2001~2009

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I , O and U

(b) Revision Code: cover all the change

(c) Serial No.: Manufacturing sequence of product

Dell PPID label contains information as below:

(a) Serial ID: TW-0SSSSS-70896-YMD-XXXX

- Serial Numbers
- Production Year, Month, Date
- Manufacturing ID
- Part Number

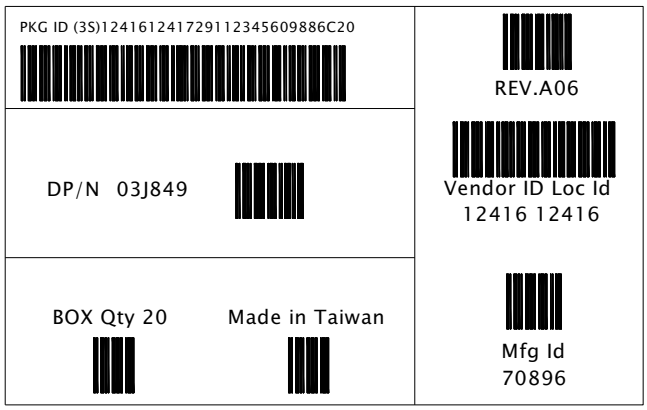
(b) Production location: Made in XXXX.

(c)Revision code: X00, X10, X20, A00..etc.

11.2 CMO CARTON LABEL

(a) Production location: Made In XXXX. XXXX stands for production location.

11.3 CARTON LABEL



Type J Label

- Verdana font or equivalent,bold
- 20pt.—all fields
- 203 DPI printer minimum
- Code 128B
- 10—15 mil minimum narrow bar
- .75"minimum barcode height
- .10" or greater quiet zone
- 4.0" x 6.0" label size
- Brady THT —25—402—1 or equivalent
- Brady R6107 series ribbon or equivalent

11.4 PALLET LABEL

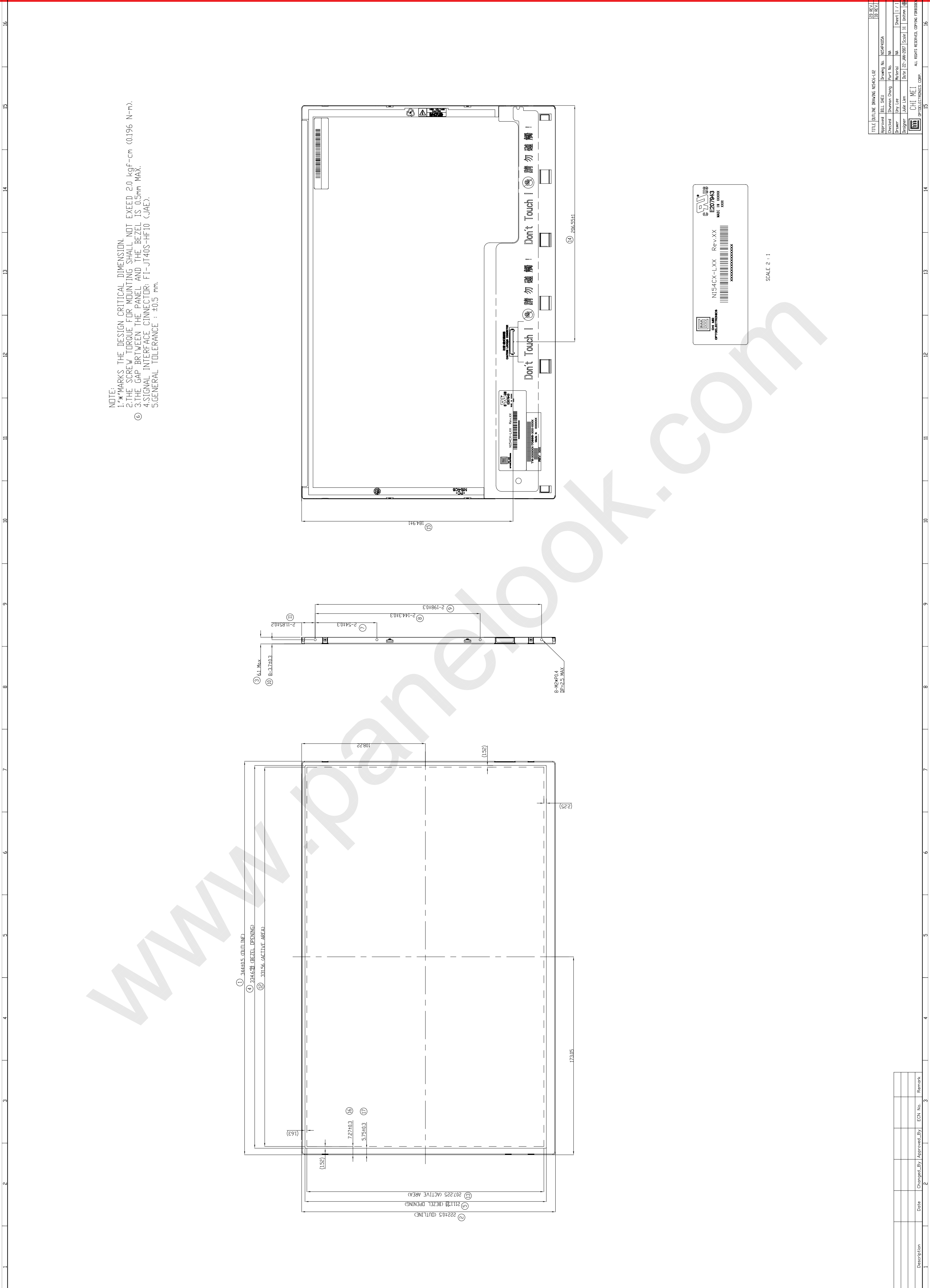
FROM :CMO Corporation Tainan, Taiwan 744 R.O.C	TO:DELL COMPUTER 2128 West Braker Austin TX
P.O.NUMBER 12345678	
	DELL P/N 12345
COUNTRY OF ORIGIN TW	
	PACKING LIST# 1234567890123
PACKING LIST QTY 654321	
	DESTINATION MAS LOC 60
DESTINATION LOCATION B4	
	AIRBILL NUMBER 12345678901234567890

PKG CNT	BOX CNT	REVISION	SHIP DATE
999 OF 999	12345	A00-00	Apr 29,2003

PART DESCRIPTION XXXXXXXXXXXXXXXXXXXXXXXXX
12345678901234567890123456789012345678901

Type K Label

- Verdana font or equivalent,bold
- 12pt.–all descript fields
- 10pt.–all data fields
- 203 DPI printer minimum
- Code 128B
- 10 mil minimum narrow bar
- .30–,50"minimum barcode height
- .10" or greater quiet zone
- 4.0" x 6.5" label size
- Brady THT –78–402–.9 or equivalent
- Brady R6107 series ribbon or equivalent


NOTE:
1."*"MARKS THE DESIGN CRITICAL DIMENSION.
2.THE SCREW TORQUE FOR MOUNTING SHALL NOT EXEED 2.0 kgf-cm (0.196 N-m).
3.THE GAP BRTWEEN THE PANEL AND THE BEZEL IS 0.5mm MAX.
4.SIGNAL INTERFACE CINNECTOR: FI-JT40S-HF10 (JAE).
5.GENERAL TOLERANCE : ±0.5 mm.
Don't Touch ! 請勿碰觸 !
N154CX-LXX Rev.XX
SCALE 2 : 1
206.55±1
184.9±1
2-198±0.3
2-144.3±0.3
2-54±0.3
2-11.85±0.2
6.1 Max
8-3.7±0.3
8-M2xP0.4 DP=2.5 MAX
108.22
(1.52)
(2.25)
344±0.5 (OUTLINE)
334.6 (BEZEL OPENING)
331.56 (ACTIVE AREA)
173.05
(1.63)
7.27±0.3
5.75±0.3
207.225 (ACTIVE AREA)
211.1 (BEZEL OPENING)
222±0.5 (OUTLINE)
CHI MEI OPTOELECTRONICS CORP.
Description
Date
Changed_By
Approved_By
ECN No.
Remark